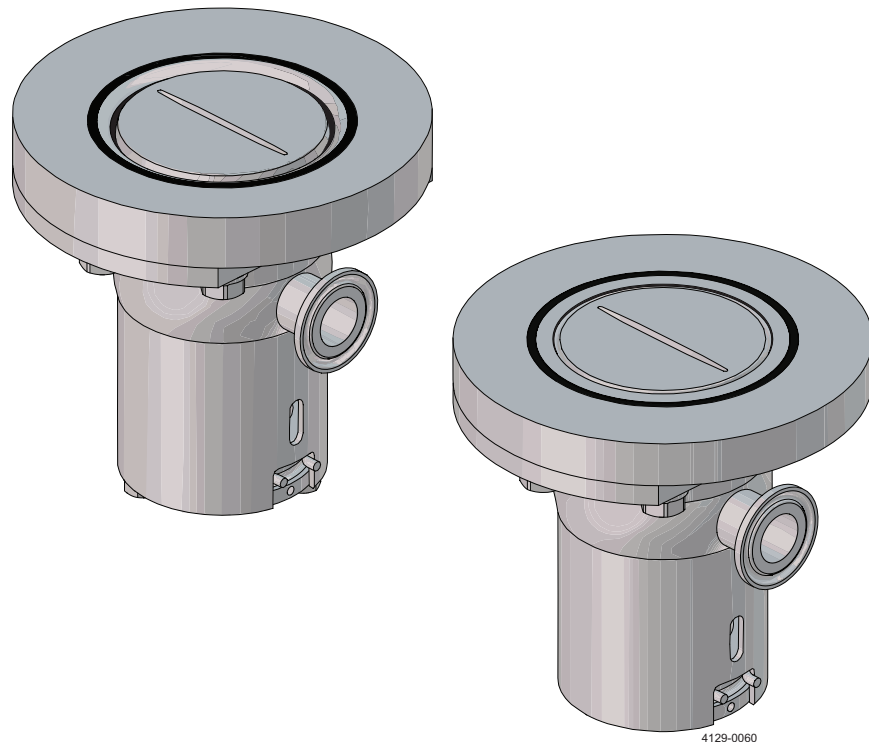


# Alfa Laval PlusClean® - Alfa Laval PlusClean® UltraPure

Wall mounted cleaning nozzle

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Lit. Code 200009288-1-EN-GB  
Manual No. 100001847

**Instruction Manual**

BRITISH ENGLISH

**Published by**  
Alfa Laval Kolding A/S  
Albuen 31  
DK-6000 Kolding, Denmark  
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**The original instructions are in English**

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# 1 Declarations of Conformity

## 1.1 EU Declaration of Conformity

The Designated Company

Alfa Laval Kolding A/S, Albuen 31, DK-6000 Kolding, Denmark, +45 79 32 22 00

Company name, address and phone number

Hereby declare that

Wall Mounted Spray Nozzle

Designation

PlusClean, PlusClean UP

Type

Serial number from 2021-0001 to 2030-99999

is in conformity with the following directives with amendments:

- Machinery Directive 2006/42/EC

The person authorised to compile the technical file is the signer of this document.

Global Product Quality Manager

Title

Lars Kruse Andersen

Name

Kolding, Denmark

Place

2022-11-14

Date (YYYY-MM-DD)



Signature

This Declaration of Conformity replaces Declaration of Conformity dated 2021-10-01



## 1.2 UK Declaration of Conformity

The Designated Company

Alfa Laval Kolding A/S, Albuen 31, DK-6000 Kolding, Denmark, +45 79 32 22 00

Company name, address and phone number

Hereby declare that

Wall Mounted Spray Nozzle

Designation

PlusClean, PlusClean UP

Type

Serial number from 2021-0001 to 2030-99999

is in conformity with the following directives with amendments:

- The Supply of Machinery (Safety) Regulations 2008

Signed on behalf of: Alfa Laval Kolding A/S

Global Product Quality Manager

Title

Lars Kruse Andersen

Name

Kolding, Denmark

Place

2022-11-14

Date (YYYY-MM-DD)





Signature

DoC Revison\_01\_112022







## 2 Safety

 	<p><b>Read this first</b></p> <p>This manual is designed for operators and service engineers working with the supplied Alfa Laval product.</p> <p>Operators must read and understand the “<b>Safety, Installation and Operating Instructions</b>” of the respective product before carrying out any work or before you put the supplied product into service!</p> <p>Before installing the machine and setting it into operation, carefully read the <a href="#">General Installation Instructions</a> on page 17 and take all necessary precautions according to your application and local regulations.</p> <p>Not following the instructions can result in serious accidents.</p> <p>This documentation describes the authorized way to use the supplied product.</p> <p>Alfa Laval will take no responsibility for injury or damage if the equipment is used in any other way.</p> <p>This Instruction manual is designed to provide the user with the information to perform tasks safely for all phases in the lifetime of the supplied product.</p> <p>The user shall always read the safety section first. Hereafter the user can skip to the relevant section for the task to be carried out or for the information needed.</p> <p><b>Always</b> read the technical data thoroughly (see <a href="#">Technical Data and Performance Data</a> on page 43).</p> <p>This is the complete manual for the supplied product.</p>
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**NOTE** The illustrations and specifications contained in this manual were effective at the date of printing. However, as continuous improvements are our policy, we reserve the right to alter or modify any unit specification on any product without prior notice or any obligation.

The English version of the instruction manual is the original manual. We make reservations regarding mistranslations in language versions of the instruction manual. In case of doubt, the English version of the instruction manual applies.


### 2.1 Safety Instructions and Warnings

Safety Signs	
	Corrosive substance.
	Do <b>not</b> disassemble.
	Dangerous electrical voltage.
	Transportation with forklift truck or other industrial vehicles if heavy.


## General Safety Precautions

	<p><b>General</b></p> <p><b>Always</b> ensure that personnel must have experience with lifting operations.</p> <p><b>Always</b> ensure the lifting point to be in line with center of gravity. Adjust lifting point if necessary.</p> <p><b>Always</b> keep an eye on the load and stay clear during the lifting operation.</p> <p><b>Always</b> ensure that the lifting equipment is suitable for the specific supplied product.</p> <p><b>Always</b> use appropriate lifting equipment for heavy parts when relevant. Use lifting logs when available.</p>
 	<p><b>Installation</b></p> <p><b>Always</b> follow this manual thoroughly.</p> <p><b>Ensure</b> that the product and CIP media is not corrosive to the cleaning device.</p> <p>Any tank cleaning machine can develop a static electricity charge while in operation.</p> <p>If the tank being cleaned contains a combustible liquid or vapor having a risk of ignition or explosion, it is imperative to have the Alfa Laval tank cleaning product properly grounded.</p>
  	<p><b>Operation</b></p> <p><b>Always</b> read this manual thoroughly.</p> <p>Necessary precautions must be taken if leakage occurs as this can lead to hazardous situations.</p> <p><b>Always</b> handle lye and acid with great care.</p> <p>When an Alfa Laval PlusClean® is operating, there should be covers over every tank opening. These covers should be sealed well enough to withstand the full force of the fan striking the cover plate.</p> <p>If the cleaning solution is hot, corrosive, or toxic, a leak would present a serious hazard to any personnel in the immediate vicinity or to any exposed electrical equipment.</p>
	<p><b>Maintenance</b></p> <p><b>Always</b> read this manual thoroughly.</p> <p><b>Never</b> service the tank cleaning machine when it is hot.</p> <p><b>Always</b> make sure the system is depressurised and drained before disassembly.</p> <p><b>Always</b> use Alfa Laval genuine spare parts.</p>
	<p><b>Transportation and Lifting</b></p> <p><b>Always</b> drain the tank cleaning machine and accessories of any liquid.</p> <p><b>Always</b> ensure that the unit is securely fixed during transportation.</p> <p><b>Always</b> use original packaging or similar during transportation.</p> <p>Incorrect installation, mounting and use, removal of security elements, lack of inspections, lack of maintenance and improper connections may cause severe personal injury or property damage. Therefore, it is important that the cleaning machine is transported, handled, installed, started, controlled, serviced and repaired correctly exclusively by qualified personnel.</p>



	<p><b>Storage</b></p> <p>Ideally, as a guide Alfa Laval recommend:</p> <ul style="list-style-type: none"> <li>• Store supplied product as supplied in original packaging</li> <li>• Port opening should be protected against any ingress</li> <li>• Bare steel (not stainless) should be lightly oiled/greased</li> <li>• Store in a clean, dry place without direct sunlight or UV light</li> <li>• Temperature range -5° C to +40° C (23° F - 104° F)</li> <li>• Relative humidity less than 60%</li> <li>• No exposure to corrosive substances (also air contained)</li> </ul> <p>The Alfa Laval PlusClean® should be washed out with clean water after each use to remove any foreign material or soft substances left in the machine that may harden during storage. A clean water rinse through the Alfa Laval PlusClean® also wash out any residues of chemical cleaners or recirculated wash water that could adversely affect the O-rings during prolonged contact in storage.</p>
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### Safety check

	<p>A visual inspection of any protective device (shield, guard, cover or other) on the supplied product shall be carried out at least every 12 months. If the protective device is lost or damaged, especially when this leads to deterioration of safety performance, it shall be replaced. The fixing of the protective device should only be replaced with fixings of the same or an equivalent type.</p> <p><b>Inspection acceptance criteria:</b></p> <ul style="list-style-type: none"> <li>• It should not be possible to reach moving parts originally protected by a protective device</li> <li>• The protective device must be securely mounted</li> <li>• Ensure that screws for the protective device are securely tightened</li> </ul> <p><b>Procedure in case of non-acceptance:</b></p> <ul style="list-style-type: none"> <li>• Fix and/or replace the protective device</li> </ul>
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### How to contact Alfa Laval

Contact details for all countries are continually updated on our website.

Please visit [www.alfalaval.com](http://www.alfalaval.com) to access the information directly.

## 2.2 Warning Signs in Text

Pay attention to the safety instructions in this manual.

Below are definitions of the three grades of warning signs used in the text where there is a risk for injury to personnel.



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

## 2.3 Requirements of Personnel

### Operators

The operators shall read and understand the instruction manual for the supplied product.

### Maintenance personnel

The maintenance personnel shall read and understand the instruction manual. The maintenance personnel or technicians shall be skilled within the field required to carry out the maintenance work safely.

### Trainees

Trainees can perform tasks under the supervision of an experienced employee.

### People in general

The public shall not have access to the supplied product.

In some cases special skilled personnel may need to be hired, like electricians and others. In some of these cases the personnel has to be certified according to local regulations with experience of similar types of work.

### How to contact Alfa Laval

Contact details for all countries are continually updated on our website.

Please visit [www.alfalaval.com](http://www.alfalaval.com) to access the information directly.

## 2.4 Recycling Information

### Unpacking

Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.



- Wood and cardboard boxes can be reused, recycled or used for energy recovery
- Plastics should be recycled or burnt at a licensed waste incineration plant
- Metal straps should be sent for material recycling

### Maintenance

During maintenance oil and wear parts in the machine are replaced.

- Oil and all non-metal wearing parts must be disposed of in accordance with local regulations
- Rubber and plastics should be burnt at a licensed waste incineration plant. If not available they should be disposed in accordance with local regulations
- Bearings and other metal parts should be sent to a licensed handler for material recycling
- Seal rings and friction linings should be disposed to a licensed land fill site. Check your local regulations
- All metal parts should be sent for material recycling
- Worn out or defected electronic parts should be sent to a licensed handler for material recycling

### Scrapping

- At end of use, the equipment must be recycled in accordance with the relevant local regulations. Besides the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact your local Alfa Laval sales company.

## 2.5 Unpacking/Delivery

The instruction manual is part of the delivery. Study the instructions carefully.



Alfa Laval cannot be held responsible for incorrect unpacking.

- 1 Inspect the delivery for visible transportation damages – Report all issues to carrier.
- 2 Check the delivery for:
  1. Complete cleaning machine
  2. Delivery note

## 2.6 Intended Use

The Alfa Laval PlusClean® is a wall mounted cleaning nozzle for cleaning of shadow areas in the tank and on tank installations; e.g. underneath agitator blades.

There is a broad range of application areas within pharmaceutical, food and chemical industries.

Some of the benefits of Alfa Laval PlusClean® are:

- It has minimal moving parts and relies on a simple spring mechanism for opening and closing
- The spring mechanism is outside the product contact area
- In the closed position, the piston and its O-ring seal against the inside of the body of the Alfa Laval PlusClean®. This prevents liquid from the tank to enter the Alfa Laval PlusClean®
- No threads or screws are used in the product contact areas
- The cleaning device is lubricated by the cleaning media
- No oil, grease or other lubricants are used

A complete description of the technical specifications and construction of the Alfa Laval PlusClean® is found in this manual. Application assistance and optimal position recommendation are available.

The end-user should verify:

- that the construction materials (both metallic and non-metallic) are compatible with product, flushing media, cleaning media, temperatures and pressure under the intended use

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## 3 Introduction

Alfa Laval PlusClean® is a wall mounted cleaning nozzle designed for cleaning of shadow areas in tanks; e.g. below agitator blades and other tank internals. PlusClean is smoothly integrated into the tank wall. When activated during Cleaning-in-Place (CIP), PlusClean covers cleaning shadow areas with a high impact fan of cleaning media, giving the market's first guarantee of 100% impact cleaning coverage.

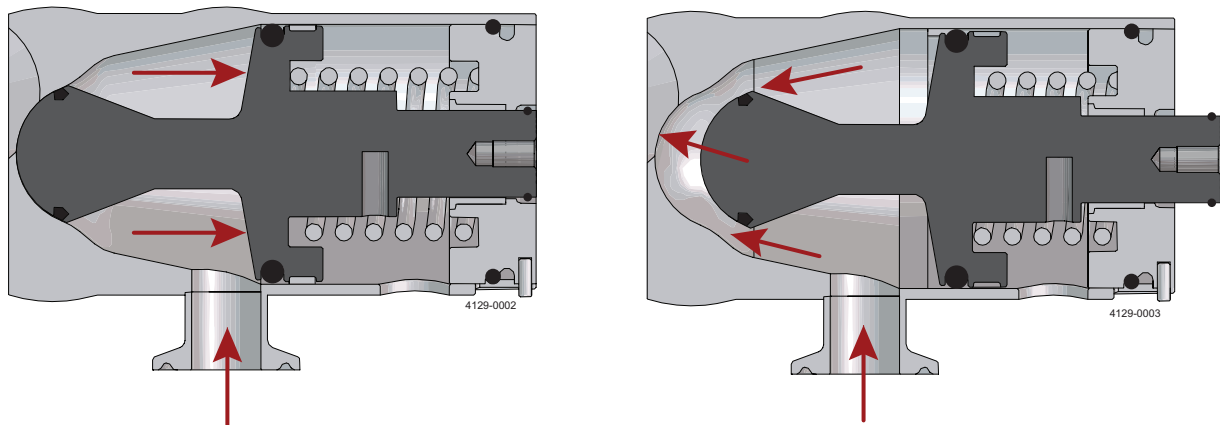
### 3.1 Functioning

The Alfa Laval PlusClean® is available in media driven or pneumatic driven versions.

Both versions have a spring mechanism located outside the product contact surface area.

#### Media driven:

- The piston retracts due to the pressure of the cleaning media and is extended back into closing position by a spring
- The cleaning media enters the body through the 3/4" inlet connection
- The liquid pushes the piston, which retracts to open position by compressing the spring mechanism
- At the same time the cleaning media passes through the body and out through the slot opening
- When cleaning is completed and the force from the cleaning media pressure drops below the spring force, the piston position is restored by the integrated spring mechanism



#### Pneumatic driven:

- The piston is retracted by an external pneumatic Actuator and restored by the spring mechanism
- Air is applied to the pneumatic Actuator. This retracts the piston to open position by compressing the spring mechanism

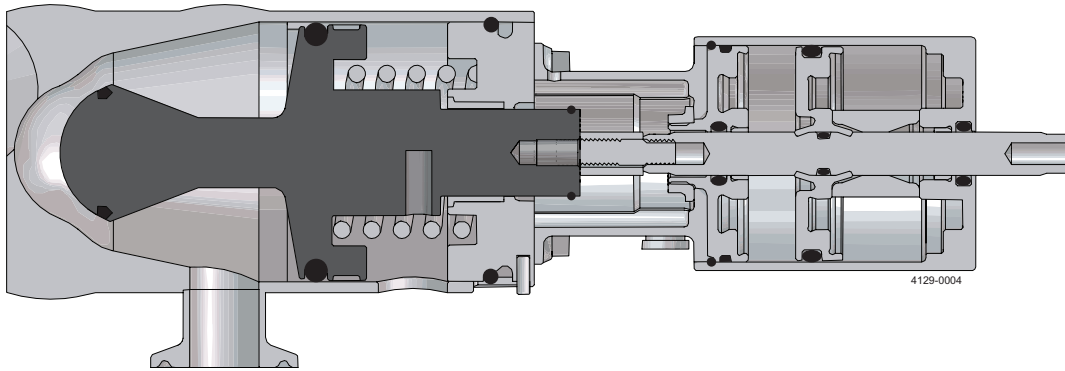
#### NOTE

**IMPORTANT:** Piston shall be retracted before cleaning media supply is started.

- The cleaning media passes through the body and out through the slot opening.
- When cleaning is completed, the supply of cleaning media is shut off.
- By shutting off the air supply to the pneumatic Actuator, the spring force restores the piston position by the integrated spring mechanism.

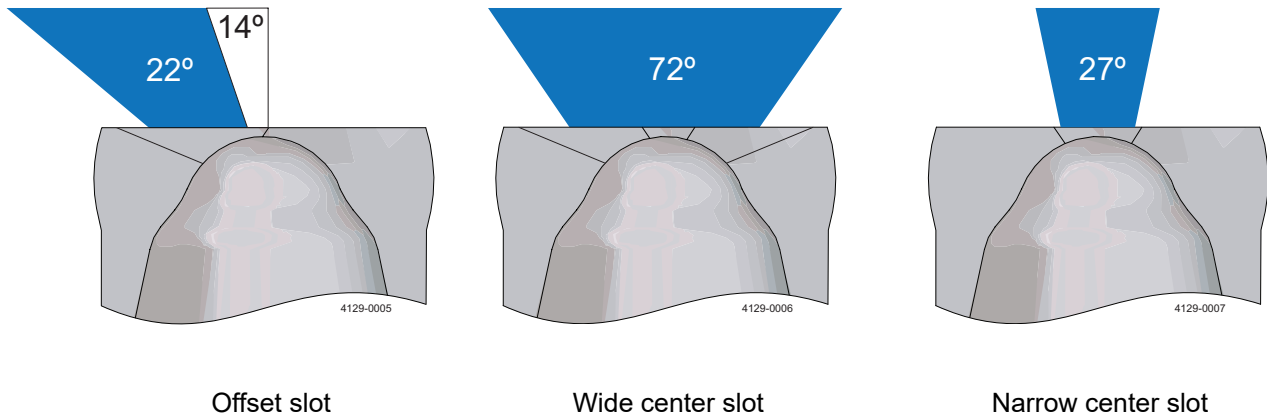
**NOTE**

For total drain the pneumatic Actuator can remain retracted during a draining phase to allow for e.g. air purging.



Both versions of the Alfa Laval PlusClean® spray out a fan due to the flow of the cleaning fluid. The pattern of this fan depends on the slot in the body as seen below. The three patterns provide fans with different spread angles and flow rates. When the cleaning media pressure is shut off, the cleaning media is drained through the 3/4" ferrule connection. The mounting position of the Alfa Laval PlusClean® is important for draining.

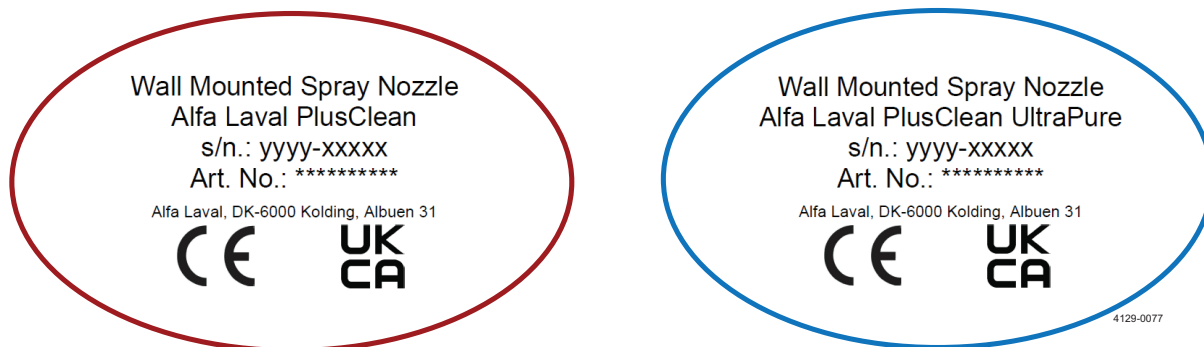
Spray pattern



## 3.2 Marking

Alfa Laval tank cleaning machines are marked to allow for recognition of type of machine, machine name, serial number, article number and manufacturing address.

The marking is placed on the side of the tank cleaning machine.



### Serial number explanation

Machines supplied with or without standard documentation:

yyyy-xxxxx: serial number

yyyy: year

xxxxx: 5 digit sequential number

\*\*\*\*\*: article number

## 3.3 Patents and Trademarks

This Instruction Manual is published by Alfa Laval Kolding A/S without any warranty. Improvements and changes to this Instruction Manual may at any time be made by Alfa Laval Kolding A/S without prior notice. Such changes will, however, be incorporated in new editions of this Instruction Manual.

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The Alfa Laval logotype is a trademark or a registered trademark of Alfa Laval Corporate AB. Other products or company names mentioned herein may be the trademarks of their respective owners. Any rights not expressly granted herein are reserved.

## 3.4 Quality System

The Alfa Laval PlusClean® cleaning nozzle is produced according to Alfa Laval Kolding's ISO 9001 international Standard certified quality system.



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## 4 Installation

### 4.1 General Installation Instructions

During handling and installation, handle the machine with care in order not to damage the product contact surface finish of the machine.

Before connecting the machine to the system, all supply lines and valves should be flushed to remove foreign particles.

It is recommended to install a fluid valve upstream of the cleaning machine to prevent hydraulic shocks. Hydraulic shocks may cause severe damage to the machine and the entire installation.

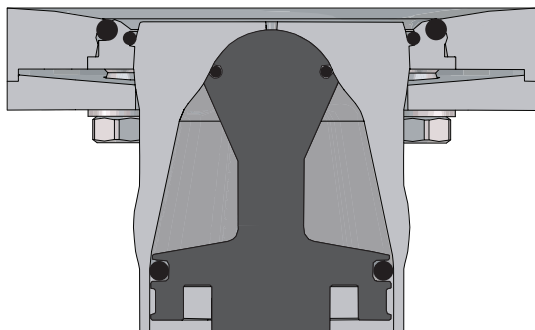
Ideally, the cleaning fluid supply pump should be frequency controlled with a ramp function for start-up.

## 4.2 Weld Plate

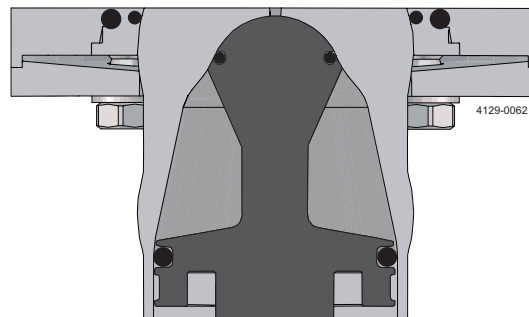
### NOTE

For installation of weld plate please refer to Appendix A at the end of the manual, see [Appendix](#) on page 55.

Alfa Laval PlusClean® has 2 types of weld plates: Adjustable weld plate and fixed weld plate.



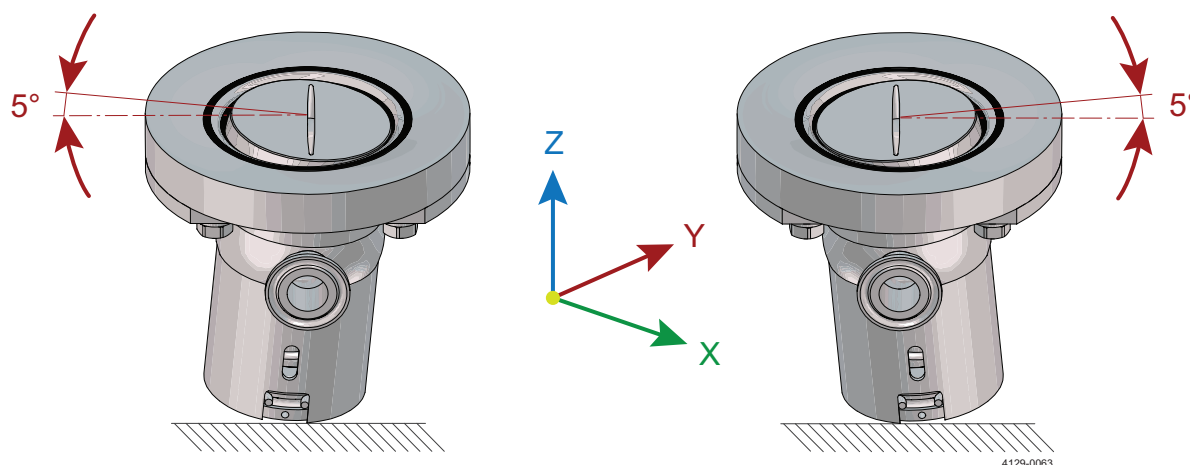
Adjustable weld plate



Fixed weld plate

The adjustable weld plate has a curved surface on the tank side of the weld plate and allows adjusting the angle of the device  $\pm 5^\circ$  from the center along all 3 axes. The adjustable weld plate with the Alfa Laval PlusClean® is only drainable when installed at an angle of more than  $30^\circ$ .

The fixed weld plate only allows the device to rotate around Z-axis. It is drainable at all angles due to the flat top surface.



The adjustable weld plate should be used in applications where the Alfa Laval PlusClean® is installed on tank walls and tank bottoms with more than  $30^\circ$  inclination to horizontal.

The fixed weld plate should be used where the Alfa Laval PlusClean® is installed on the tank bottom or surface with less than  $30^\circ$  inclination to horizontal.

Both types of weld plates have the same outer dimension and same welding process.

## 4.3 Installation

### NOTE

For installation of weld plate please refer to Appendix A at the end of the manual, see [Appendix](#) on page 55.

**Always** read the technical data thoroughly.

Every Alfa Laval PlusClean® is operationally tested before shipment and is ready to run after unpacking. No assembly is required prior to use.

Any change to the originally supplied operating conditions will affect the performance of the Alfa Laval tank cleaning product accordingly.

### 4.3.1 Inlet Connections

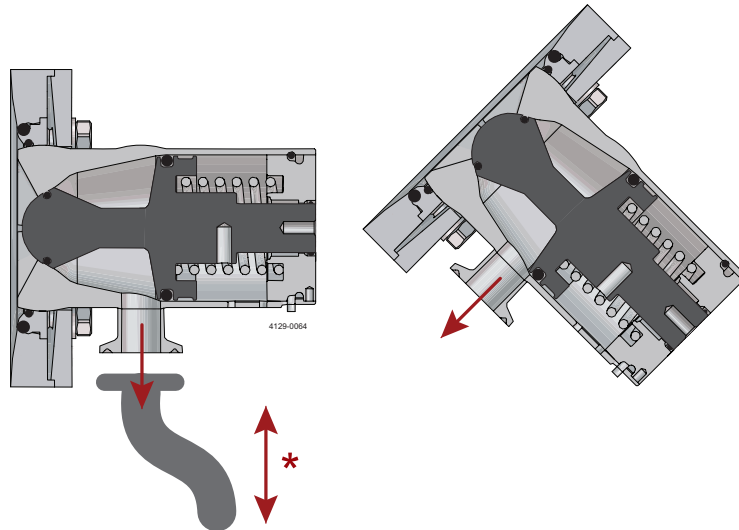
- The Alfa Laval PlusClean® has a 3/4" ferrule connection on the inlet side. (ASME BPE – L14AM-0.75 / DIN 32676 Reihe A DN 15)
- Centre of inlet should be aligned with center of piping system
- It is recommended to have a separate CIP supply line for each spray device used for the tank

**If installed on a common CIP supply line make sure that either:**

1. each spray device has the correct pressure at its inlet or
2. only one of the spray devices is running at a time with the correct pressure at its inlet

### 4.3.2 Mounting

- Before mounting the Alfa Laval PlusClean® make sure the supply line has been adequately flushed
- In all applications, the device should be mounted in the position where the inlet is directed downwards, to allow draining at all times
- The Alfa Laval PlusClean® is designed for draining if installed according to the orientations shown (for other orientations removal of residual liquid may be achieved using external force e.g. purging for the device with pneumatic Actuator)



\*) Important: Ensure flexibility in the supply line to accommodate the nozzle adjustment feature.

#### NOTE

The adjustable weld plate allows adjusting the angle of the PlusClean nozzle  $\pm 5^\circ$  from the center along all 3 axes. The fixed weld plate allows the PlusClean to rotate around the centerline.

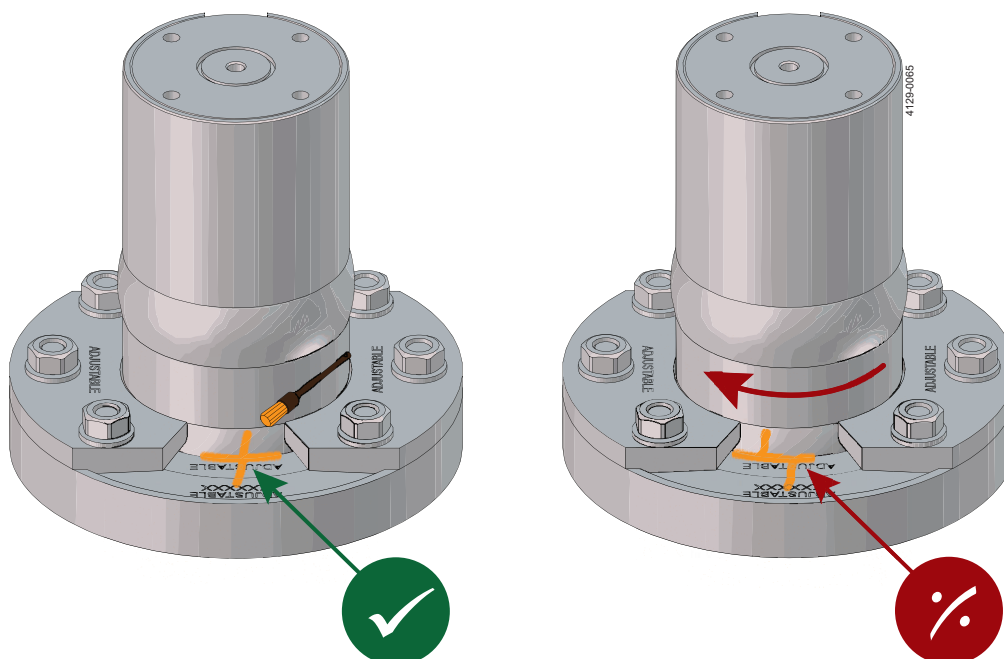
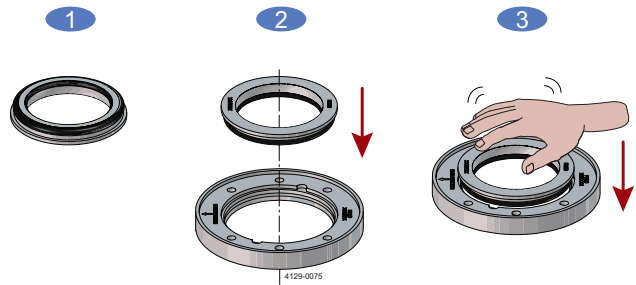


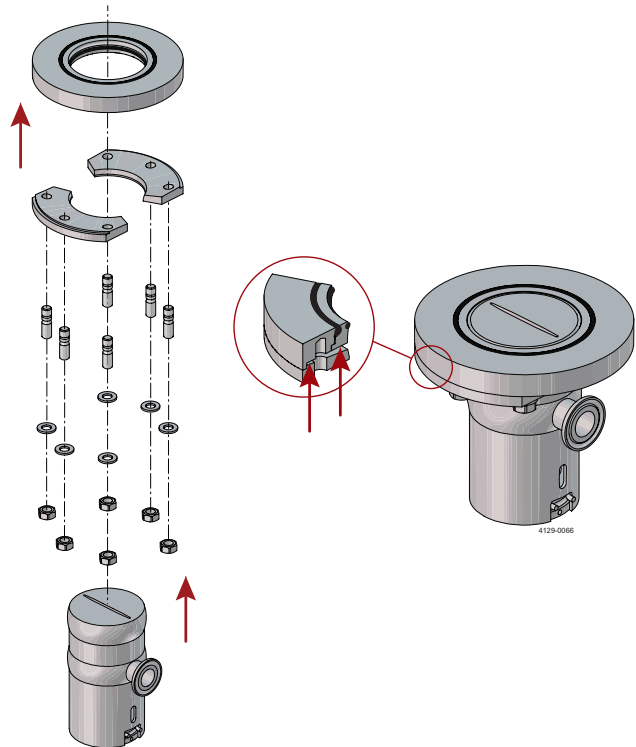
Figure 1: Position of PlusClean nozzle

To ensure that the PlusClean nozzle, after service / maintenance, is placed in exactly the same position as when commissioning, we recommend that a clear marking of the position is made already during commissioning. Marking must be done on both the weld plate and the nozzle - as opposed to the inlet orientation (marked with an arrow). Marking is done by engraving or with permanent ink / paint. Alternatively, when the correct position is determined, locking rings can be spot welded to the nozzle body. See figure *Position of PlusClean nozzle* on page 20.

- 1 Install both O-rings on adapter and then push adapter into the weld plate.



- 2 Mount the Alfa Laval PlusClean® inside the weld plate with adapter and put in the locking rings to hold the device in place. The groove on the weld plate should align with the step on the locking ring to ensure correct installation of the device.



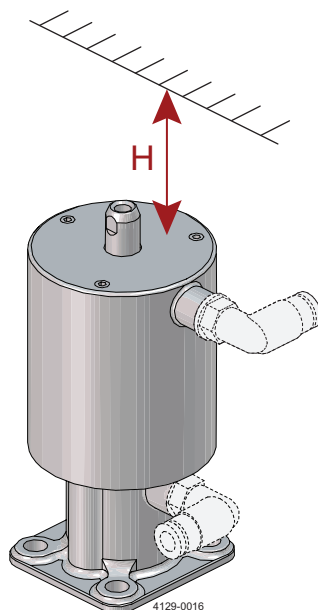
- 3 Orientate the Alfa Laval PlusClean® in the desired position and fasten the bolts.

4

### Minimum free space above Actuator

When installing the device with Actuator without indication unit (for example a ThinkTop® unit), a minimum distance of 122 mm/4.803" (H) above the Actuator is required to avoid pinching of a hand placed on top of the Actuator.

H = Min. distance: 122 mm/4.803"



### Vessel drainage

- Standing liquid diminishes the effectiveness of the Alfa Laval PlusClean®. Hence, it is important that the tank bottom is drained during cleaning with the Alfa Laval PlusClean®
- Wherever possible, the tank bottom should be pitched toward an opening and the opening should be large enough to eliminate or reduce any liquid buildup or puddling
- If gravity alone is insufficient, a scavenger or suction pump should be connected to the drain to suck out the excess wash fluid

### Filters and strainers

- It is recommended to install a filter in the supply line in order to avoid particles, scale etc. from clogging the inside of the machine
- For low amounts of particles in the recirculating CIP liquid, larger particles should be avoided and, in this case, a 3 mm (0.12") strainer may be sufficient for a reliable operation
- For high amounts of particles in the recirculating CIP liquid, it is recommended to install a strainer of 1 mm (0.04")
- It is essential to avoid fine solid particles, such as fine sand, in the cleaning fluid as they increase wear considerably and may clog the slots. This is particularly important in case of recirculation
- Before installation, all supply lines and valves must be thoroughly flushed to remove remains of welding electrodes, grinding dust, scale and other foreign matter

### Safety

#### NOTE

When Alfa Laval tank cleaning products are operating, there should be covers over any tank openings. These covers should be sealed well enough to withstand the full force of the water striking the cover plate. If the cleaning solution is hot, corrosive, or toxic, a leak would present a serious hazard to any personnel in the immediate vicinity or to any exposed electrical equipment.

 **WARNING**

Any tank cleaning machine can develop a static electric charge while in operation. If the tank being cleaned contains a combustible liquid or vapor having a risk of ignition or explosion, it is imperative to have the Alfa Laval tank cleaning product properly grounded.

## 4.4 Mounting Blind Cap

When Alfa Laval PlusClean® is not installed, a blind cap can be used to block the opening. For more information on blind cap contact your local Alfa Laval office.

- Mount the O-ring that fits the weld plate in the O-ring groove.
- Insert the blind cap into the weld plate.
- Put the locking ring around the assembly. Put the screws in and tighten them to apply pressure until metal-to-metal contact in the connection is achieved.

A: Weld plate, Adapter and O-ring

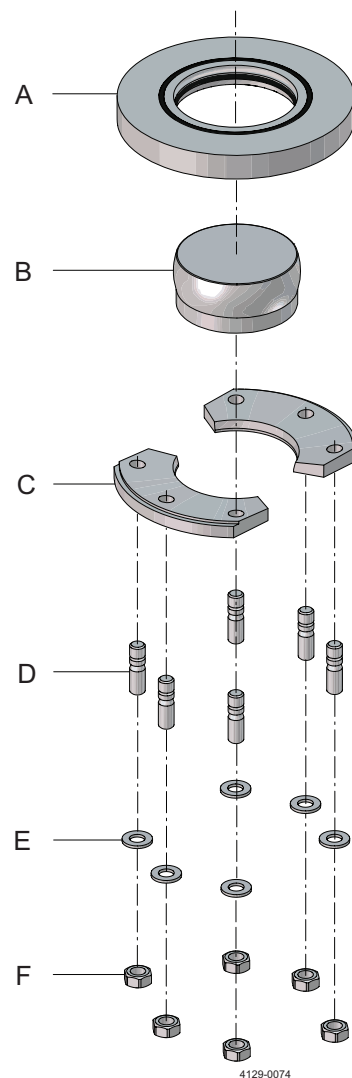
B: Blind cap

C: Locking ring

D: Stud

E: Washer

F: Nut





## 5 Operation

### Cleaning media

- Use only media compatible with the device. Normal detergents, moderate solutions of acids and alkalis are acceptable
- Aggressive chemicals, excessive concentrations of chemicals at elevated temperatures, as well as certain solvents hydrochlorides should be avoided. If in doubt, contact your local Alfa Laval sales office
- To separate the CIP system from the process it is recommended to install a shutoff valve close to the machine inlet

### Temperature

- The machine is designed to operate with cleaning media at temperatures up to 95° C (203° F). However, it stands temperatures up to 150° C (302° F) inside the tank
- It is possible to steam the tank through the machine at a maximum of 121° C (250° F)
- It is advisable to use the Alfa Laval PlusClean® with the Actuator when using air/steam or when purging the system (otherwise there is a risk of hammering of the piston)

### Pressure

- Please make sure that the CIP process connections are correctly mounted before the Alfa Laval PlusClean® is put into operation
- Apply cleaning media pressure gradually to avoid hydraulic shocks. Hydraulic shocks might stress mechanical parts in the Alfa Laval PlusClean®
  - **Media driven Alfa Laval PlusClean®**
    - Recommended CIP working pressure: 1.9 - 7 bar (27.6 - 101.5 PSI)
    - Recommended CIP operating pressure: 2 – 5 bar (29.0 - 72.5 PSI)
    - Tank pressure range: -1 - 4 bar (-14.5 - 58 PSI)
  - **Pneumatic driven Alfa Laval PlusClean®**
    - Air supply pressure: 4 - 10 bar (58 - 145 PSI)
    - For CIP pressure > 4 bar (58 PSI), the air supply pressure must be ≥ the CIP pressure
    - Maximum air supply pressure for the Actuator: 10 bar (145 PSI)
    - Recommended CIP working pressure: 1.9 - 7 bar (27.6 - 101.5 PSI)
    - Recommended CIP operating pressure is: 2 – 5 bar (29.0 - 72.5 PSI)
    - Tank pressure range: -1 - 6 bar (-14.5 - 87 PSI)

### Cleaning of the device

- The surfaces of Alfa Laval PlusClean® exposed to the inside of the tank are cleaned by the falling film of cleaning liquid with a minimum flow of 2.5 gal/min/ft (31L/min/m) of inner vessel circumference
- After use flush the machine with fresh water
- Cleaning media should never be allowed to dry or set-up in the system due to possible "salting out" or "scaling" of the cleaning media. If cleaning media contains volatile chloride solvents, it is recommended not to flush with water after use, as this might create hydrochloric acid

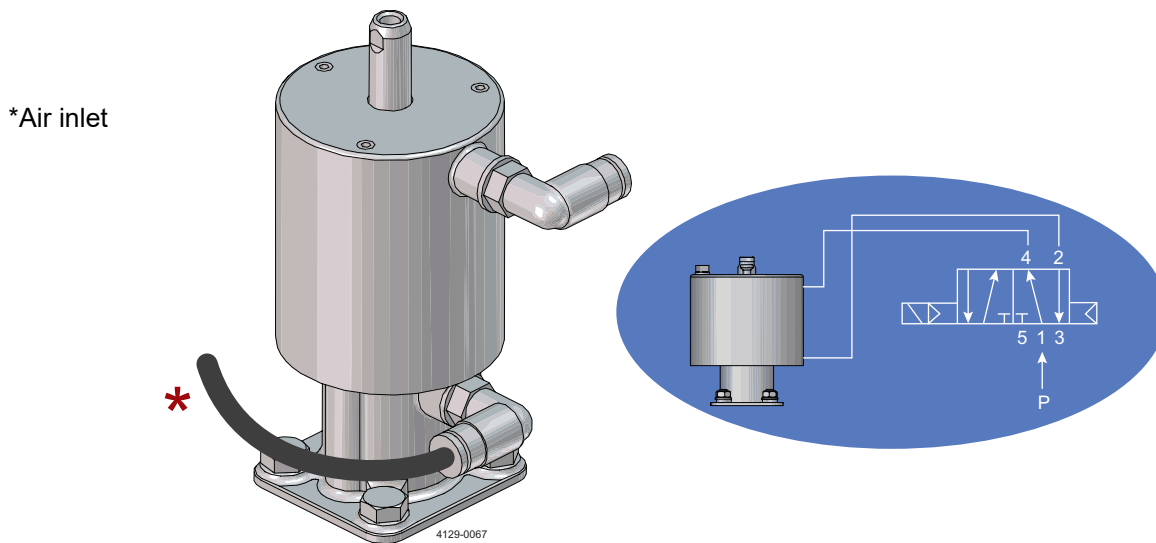
- Hot chemicals and steam under pressure may be used for cleaning and sterilizing
- Protect against scalding and burning
- Never tamper with, or try to open, clamps or other connections while system is in operation
- Make sure that system is de-pressurized and drained before disassembly

## 5.1 Actuator

### Actuator

Function AA: Air/Air (double acting)

- For the Alfa Laval PlusClean® it should only be used for opening the Alfa Laval PlusClean®
- The Alfa Laval PlusClean® is opened by applying control pressure to the bottom control connection
- Connection below: open, connection above: close.
- With a solenoid valve 4/2 and 5/2 way for connection below and above



## 6 Maintenance

### 6.1 Preventive Maintenance

Following the Alfa Laval Preventive Maintenance Guidelines and using the Alfa Laval Service Kits ensures the availability of your equipment at all times and enables you to plan your operating budget and your downtime. The risk of unscheduled breakdowns due to component failure is virtually eliminated and in the long term your operating costs are reduced.

Alfa Laval Tank Cleaning Equipment Service Kits contain all you need. They comprise genuine, traceable Alfa Laval spare parts, manufactured to the original specifications.

The recommended preventive maintenance program is based on tank cleaning machines working in average conditions. However, a tank cleaning machine, exposed to heavy soiling and recirculation CIP liquid containing abrasives and/or particulates needs more frequent attention than one exposed to light/no soiling and recirculation with ordinary CIP liquid. Alfa Laval Kolding A/S recommends that you adjust the maintenance program to suit the cleaning task in hand. Contact your local Alfa Laval sales office for discussion.

For further information regarding Alfa Laval Service Kits and service intervals, see [Recommended Service Intervals and Service Kits](#) on page 30.

#### NOTE

Handle the Alfa Laval PlusClean® machine with care. Take proper action to protect surfaces from being damaged. Always use only proper tools. Never use force, hammer or pry components together or apart. Always perform all assembly/disassembly steps in the order described in this manual. Clean all surfaces prior to assembling. Especially take care of the mating surfaces. Work in a clear well-lighted work area.

## 6.2 Troubleshooting

Problem	Possible causes	Action
Water leaking out of the end plate	<ul style="list-style-type: none"> <li>Worn out O-ring</li> </ul>	<ul style="list-style-type: none"> <li>Replace the O-ring with a new one</li> </ul>
Piston not restoring in original state	<ul style="list-style-type: none"> <li>Damaged spring</li> <li>Debris in the slot</li> <li>Worn out O-ring on piston head</li> </ul>	<ul style="list-style-type: none"> <li>Replace the spring with a new one</li> <li>Try running clean water through the device to get rid of debris</li> <li>Replace the O-ring on piston head</li> </ul>
Poor cleaning performance	<ul style="list-style-type: none"> <li>Insufficient flow/pressure</li> <li>Incorrect cleaning media</li> <li>Debris in slot</li> <li>Poor drainage of tank</li> </ul>	<ul style="list-style-type: none"> <li>Refer to the pressure-flow graph to reconfirm the operating conditions at the device</li> <li>Verify the temperature and concentration of the cleaning media</li> <li>Inspect the slot for any debris</li> <li>Determine if the deposit being cleaned requires greater impact or longer impact time for more thorough scrubbing</li> <li>Ensure the tank drains cleaning fluid at an equal or faster rate than sprayed in through all cleaning devices</li> </ul>

## 6.3 Recommended Cleaning

### CAUTION

**Never** touch the supplied product or the pipelines when sterilizing.

**Always** handle CIP and SIP lye and acids with great care.

**Always** use rubber gloves!

**Always** use protective goggles!

**Always** rinse well with clean water after using a cleaning agent.



### NOTE

The cleaning agents must be stored/disposed of in accordance with current regulations/directives.

## 6.4 Recommended Service Intervals and Service Kits

It is recommended that the wear parts are checked every 500 working hours for machine working under normal conditions.



### Every 500 working hours:

(#) refers to position numbers, see [Parts Lists and Exploded Views](#) on page 49 ff.

1. Disassemble machine as described on the following pages
2. Clean material build-up and deposits from internal parts
3. Replace O-rings (2, 3, 10 and 11) if damaged
4. Check the guide ring (12) for any damage and replace if worn
5. Assemble machine as described in the following pages

Apart from the parts specifically mentioned above, all the remaining wear parts should regularly be inspected for wear.

## 6.5 Dismantling

### NOTE

A rigorously implemented preventative maintenance program significantly reduces repair costs of the Alfa Laval PlusClean®.

The foundation of such a program is regularly scheduled inspections to discover and replace worn or damaged parts before they can cause failure of other, more costly, components.

All the O-rings are wear parts. Ideally, they should all be replaced, as a group, every servicing.



### **Storage**

See [Safety Instructions and Warnings](#) on page 7 ff.

## 6.5.1 Dismounting the Pneumatic Actuator

**NOTE**

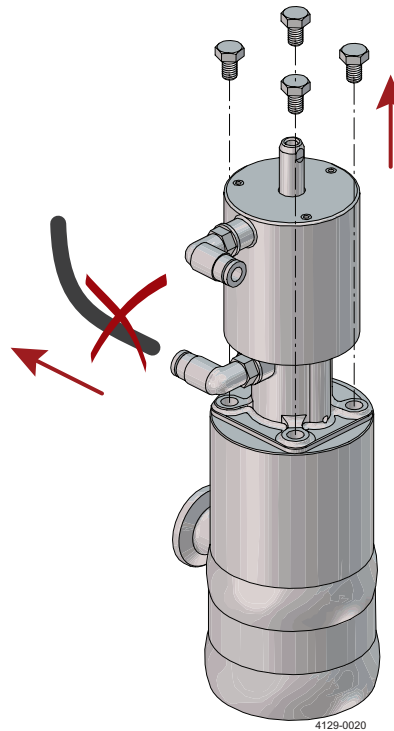
Place a soft towel (or equivalent) under the Alfa Laval PlusClean® assembly to prevent it from getting scratched.

1

Depressurize the Actuator.

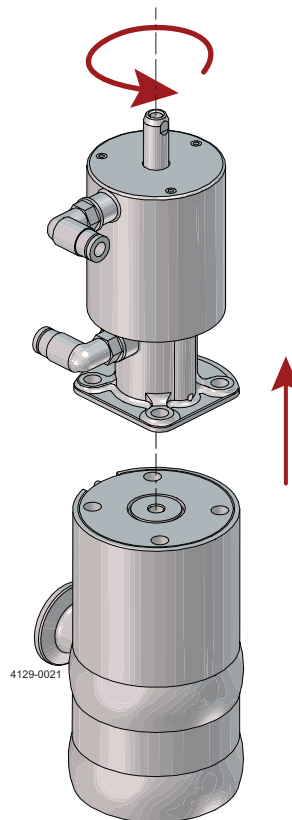
Disconnect the air supply. This will actuate the device to “closed” position.

Remove the screws holding the Actuator in place.



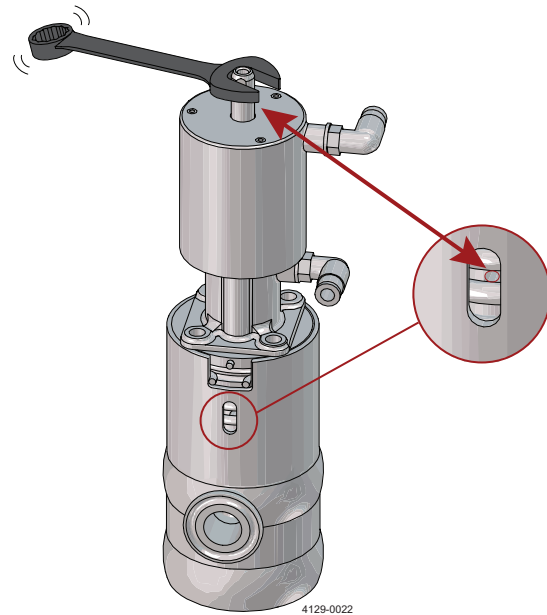
2

Rotate the Actuator anti-clockwise to unscrew the connecting stud (if too tight see below) and separate the Actuator from the Alfa Laval PlusClean®.

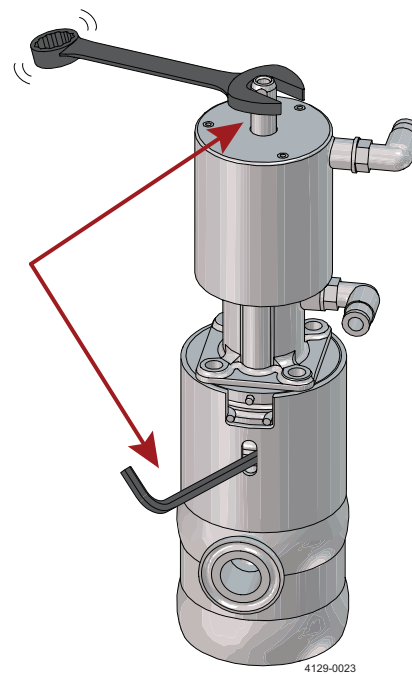




In case of tightened stud, use a wrench and rotate the Actuator spindle till the hole on the Alfa Laval PlusClean® piston is in-line with the opening on the body.

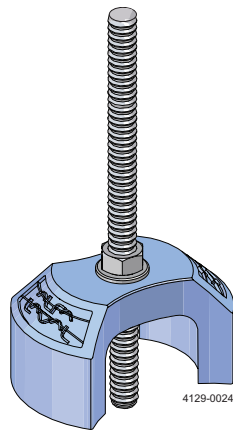


Insert a tool like Allen key in the hole (5 mm/0.2") to lock the piston rotation and loosen the Actuator spindle to dismount it.

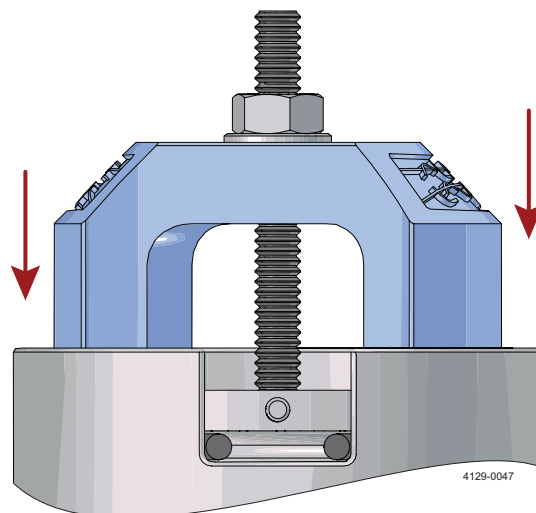
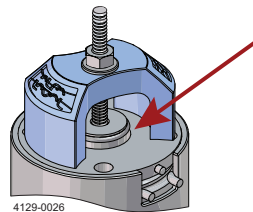
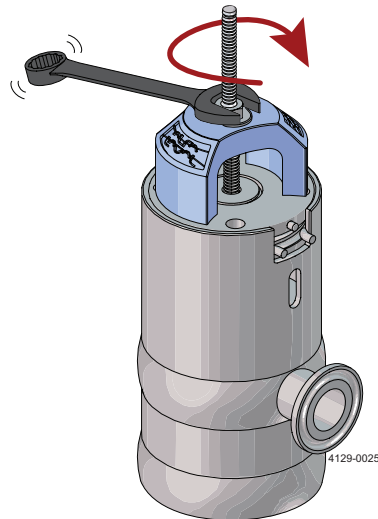


## 6.5.2 Disassembly of Alfa Laval PlusClean®

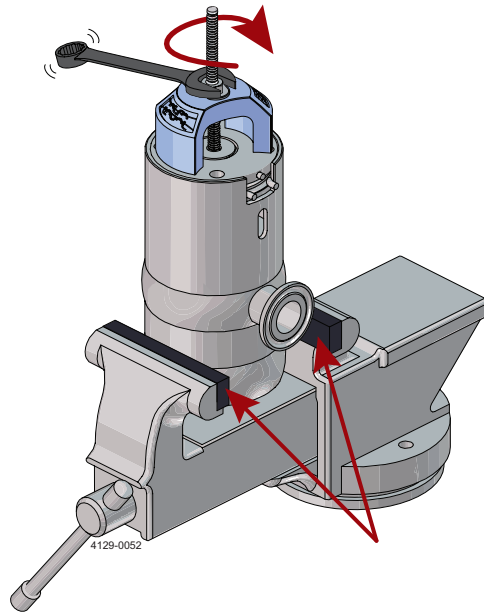
- 1 Use the spring tool and assemble it with the threaded rod, washer and nut provided.



- 2 Place the Alfa Laval PlusClean® with the end plate facing up. Screw spring tool assembly into the piston firmly. Rotate the nut clockwise with help of wrench pushing the end plate down until the retaining ring is aligned with the bigger groove on the end plate.



- 3 Secure the machine in a vise without causing surface damage to it.

**WARNING****Use soft jaws on the vise.**

4

With the help of pliers squeeze the ends of retaining ring until it is disengaged from the groove.

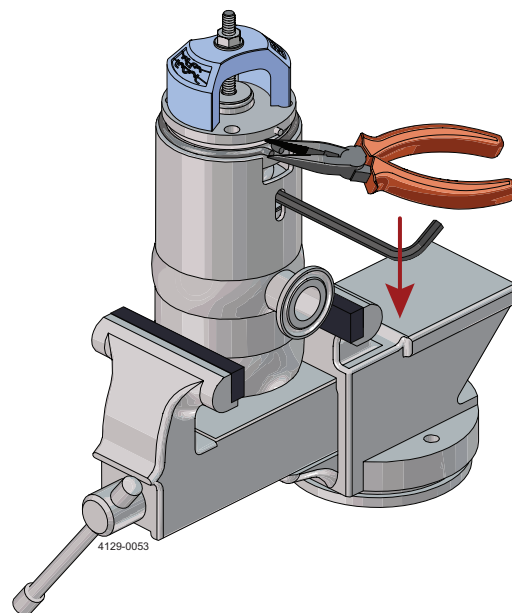
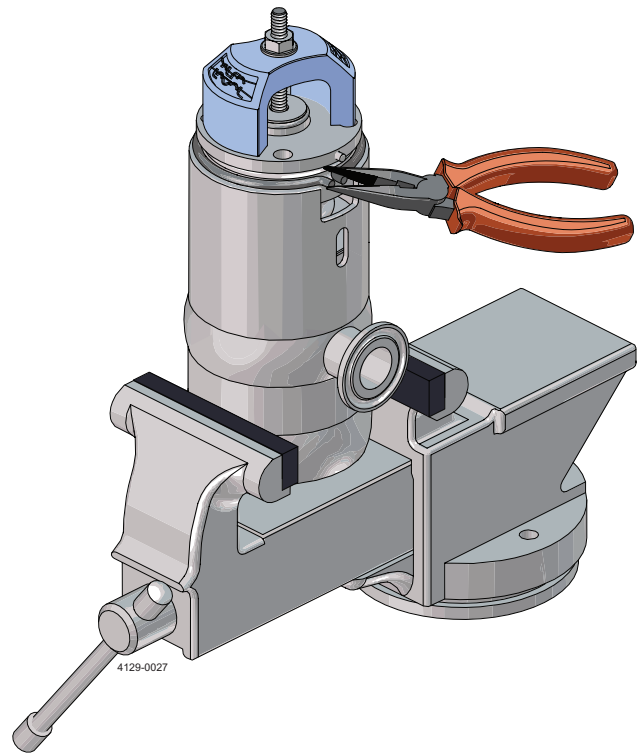
Pull the entire assembly of end plate and piston out of the body (if too tight see below).

In case it is hard to pull out the assembly, insert a tool like Allen key (5 mm/0.2") in the hole on the piston through the opening on the body and push it downwards to raise the end plate out of the body. Pull the entire assembly of end plate and piston out of the body.

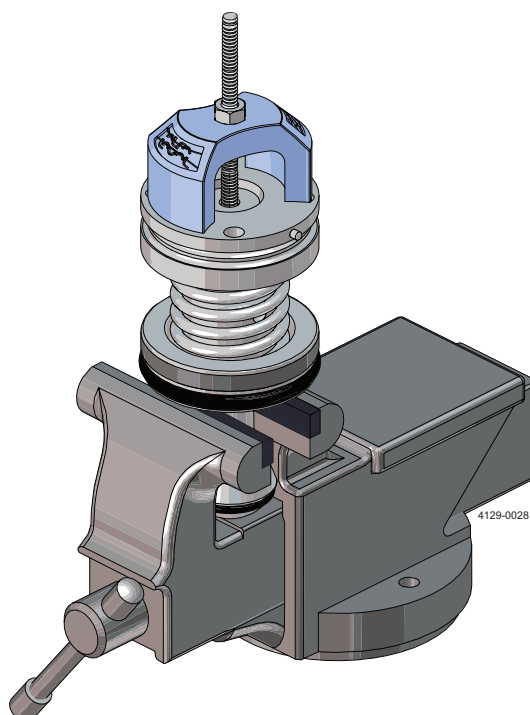
**NOTE**

For replacing the service kit remove the spring tool and go to step 5 on page 37.

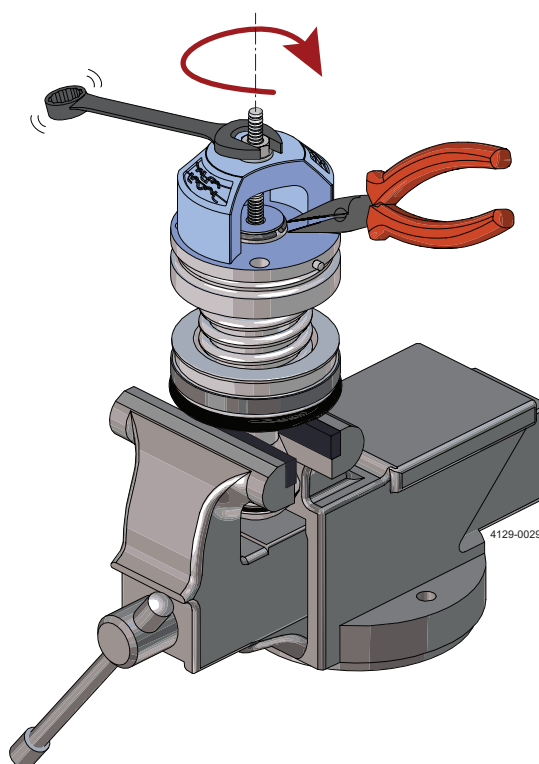
To replace the spring or bushing continue with step 8 on page 38.



- 5 Secure the piston with the spring tool mounted on it in a bench vise without causing surface damage to it.



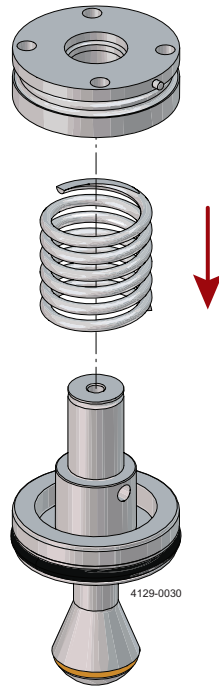
- 6 Using a wrench, turn the nut on the spring tool clockwise pulling the piston up from the end plate until the small retaining ring is exposed. With help of pliers remove the small snap ring from its groove.



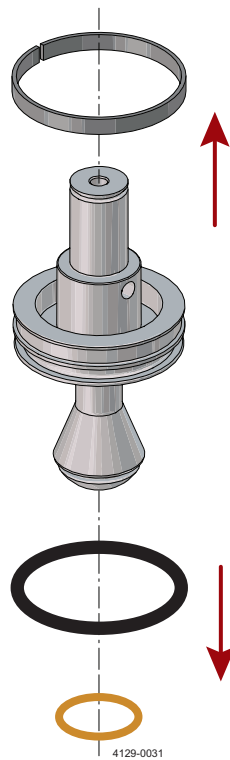
- 7 Carefully unthread the spring tool from the piston to separate the end plate from the piston. Remove the spring from the piston.

**CAUTION**

With no retaining ring holding the spring, the spring will push out the end plate with force.



- 8 Remove the guide ring and both O-rings. If they are damaged replace with new ones.



### 6.5.3 Inspection of Parts

- Inspect all machined features and slot to be sure they are clear and free of debris. Especially check for debris in slot in body
- Inspect the O-rings, guide ring and bushing for deterioration (hardening or deformation) or damage and replace if necessary
- Check the spring and replace if any crests are damaged

### 6.5.4 Reassembly of Alfa Laval PlusClean®

**NOTE**

All parts must be cleaned thoroughly before reassembling.

Any deposits remaining on the parts can cause difficult disassembly the next time the Alfa Laval PlusClean® needs servicing.

Assemble each O-ring using water for lubrication.

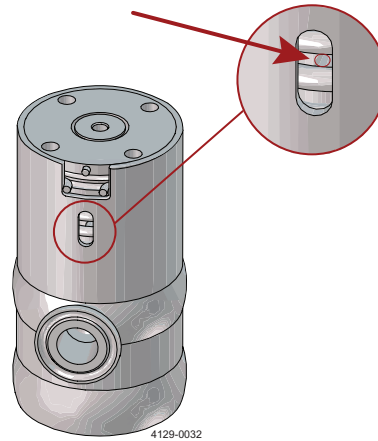
Reassembly of the Alfa Laval PlusClean® is carried out in the opposite order.

## 6.5.5 Mounting the Pneumatic Actuator

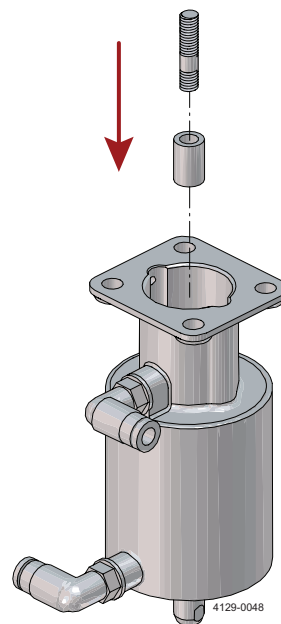
**NOTE**

Place a soft towel (or equivalent) under the Alfa Laval PlusClean® assembly to prevent it from getting scratched.

- 1 Make sure the hole on the piston is aligned with the opening in the body.



- 2 Assemble the Actuator with the stud and spacer.

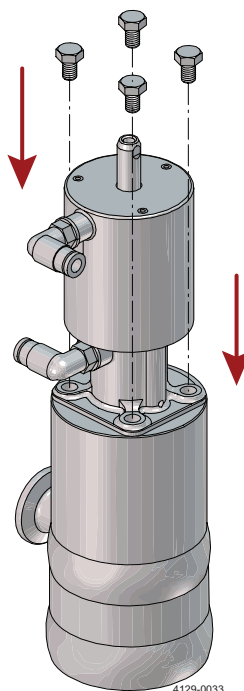




3

Mount the Actuator on the Alfa Laval PlusClean®. Rotate it clockwise until it touches the end plate and all the screw holes are aligned.

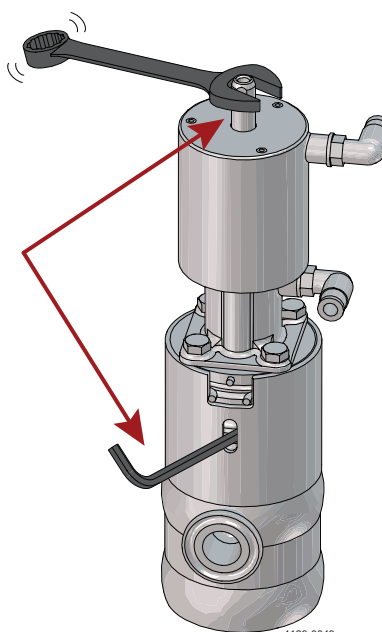
Fit in the screws.



4

Insert a tool like Allen key in the hole (5 mm/ 0.2") on the piston to fix its position.

Tighten the Actuator spindle with a wrench to a torque of 11.8 Nm = 8.7 lb ft.



**WARNING**

**Never** disassemble the Actuator.

Alfa Laval Kolding A/S do not recommend or support disassembly of the Actuator.

The Actuator is non-serviceable. With malfunction the complete Actuator must be replaced.



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**CSI**

CONTACT CSI FOR MORE INFORMATION | [CSIDESIGNS.COM](http://CSIDESIGNS.COM) | [SALES@CSIDESIGNS.COM](mailto:SALES@CSIDESIGNS.COM) | 417.831.1411

## 7 Technical Data and Performance Data

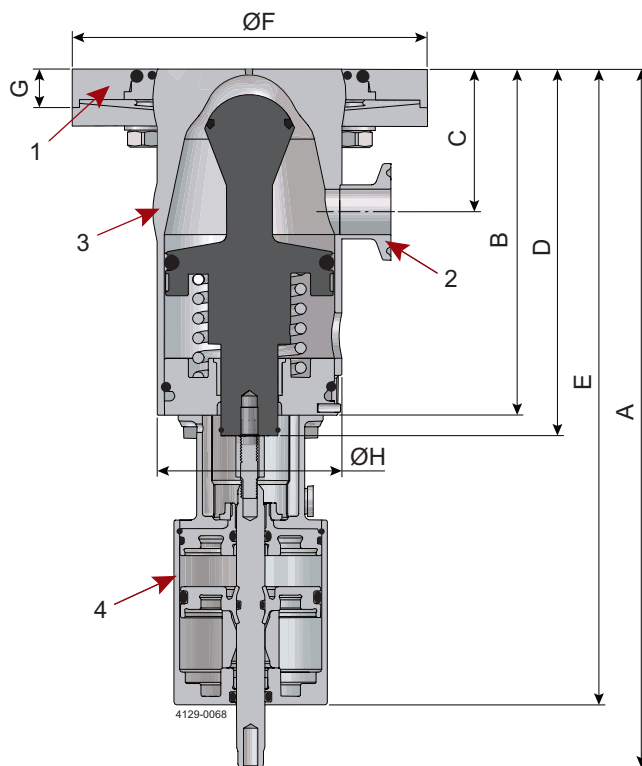
### 7.1 Technical Data

#### Technical Data

Weight of Alfa Laval PlusClean®:	Media driven: 2.1 kg (4.6 lbs) Air driven: 2.7 kg (6 lbs)
Working pressure:	1.8 - 7 bar (26.1 - 101.5 PSI)
Recommended inlet pressure:	2 - 5 bar (29 - 72.5 PSI)
Maximum working temperature:	95° C (203° F)
Maximum sterilization temperature:	121° C (250° F)
Maximum tank temperature:	150° C (302° F)
Ambient temperature:	0 - 150° C (0 - 302° F)
Actuator air connection thread size:	ISO 2881/ G1/8"

#### Materials

Products area:	AISI 316L, EPDM, FEP
Non products area:	AISI 304, PEEK, PTFE



Principal dimensions

1. Tank connection
  2. Inlet connection for cleaning media: 3/4" Clamp
  3. Alfa Laval PlusClean®
  4. Pneumatic Actuator
- A - H: See table [Dimensions Media driven, mm \(inch\)](#) on page 44 and table [Dimensions Pneumatic driven, mm \(inch\)](#) on page 44

## 7.2 Dimensions

Table 1: Dimensions Media driven, mm (inch)

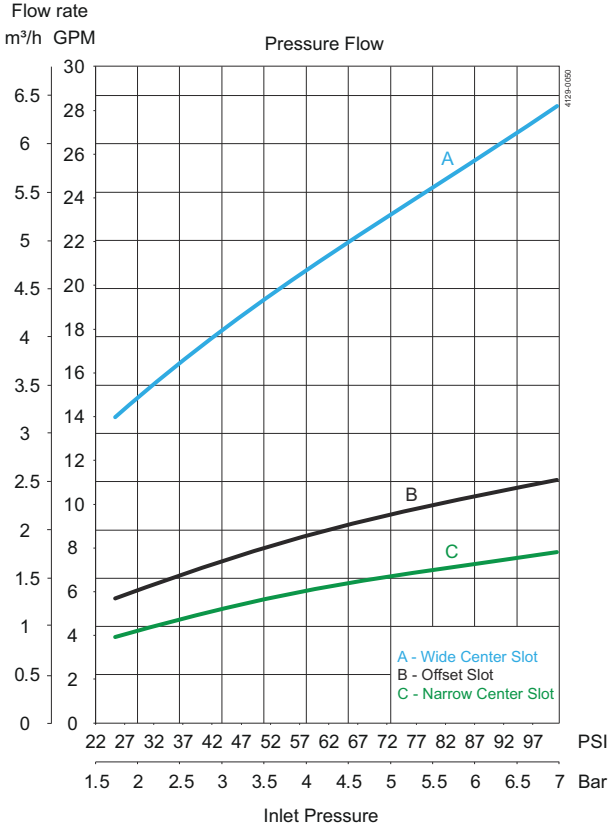
Stroke	A	B	C	D	E	F	G		H	Weight
							Adjustable Weld Plate	Fixed Weld Plate		
10.9 (0.4)	NA	122 (4.8)	50.5 (2)	132 (5.2)	NA	130 (5.1)	18 (0.7)	15 (0.6)	65 (2.6)	2.1 kg (4.6 lbs)

Table 2: Dimensions Pneumatic driven, mm (inch)

Stroke	A	B	C	D	E	F	G		H	Weight
							Adjustable Weld Plate	Fixed Weld Plate		
10.9 (0.4)	246.5 (9.7)	122 (4.8)	50.5 (2)	132 (5.2)	224 (8.8)	130 (5.1)	18 (0.7)	15 (0.6)	65 (2.6)	2.7 kg (6 lbs)

### 7.3 Performance Data

**Flow rate**

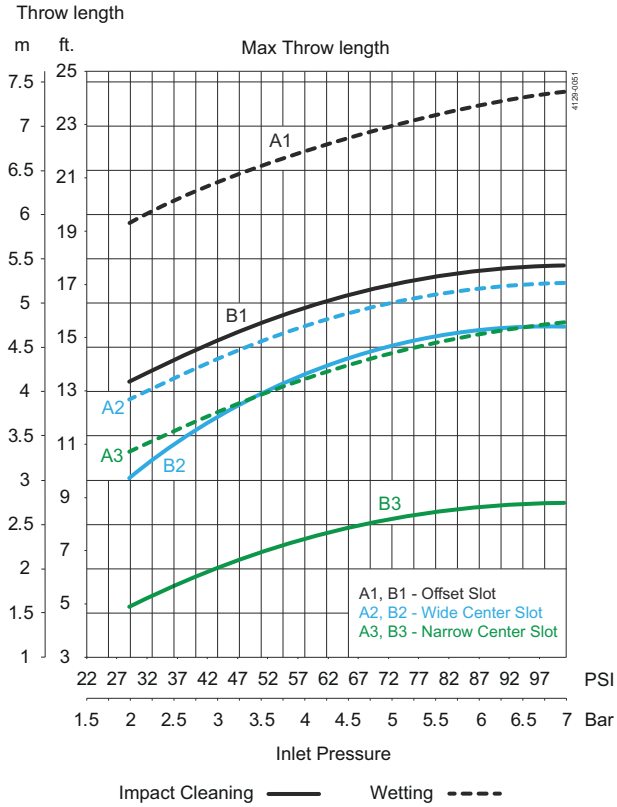


A: Wide center slot - B: Offset slot - C: Narrow center slot

**NOTE**

The inlet pressure has been measured immediately before the machine inlet. In order to achieve the performance indicated in the curves, the pressure drop in the supply lines between pump and machine must be taken into consideration.

### Throw length/cleaning radius



A1: Wetting - Offset slot - A2: Wetting - Wide center slot  
 A3: Wetting - Narrow center slot - B1: Impact cleaning - Offset slot  
 B2: Impact cleaning - Wide center slot  
 B3: Impact cleaning - Narrow center slot

**NOTE**

The inlet pressure has been measured immediately before the machine inlet. In order to achieve the performance indicated in the curves, the pressure drop in the supply lines between pump and machine must be taken into consideration.

#### Performance data for Alfa Laval PlusClean® Pneumatic Driven

- Air supply pressure: Minimum 4 bar (58 PSI) to open the piston
- Air quality: Clean filtered max. 40 µm
- Dry, dew point max. 5° C (41° F)
- Non-lubricated possible

## 8 Pressure Rating for Weld Plates

### 8.1 Specification of Pressure Weld Plates According to PED 2014/68/EU

Specification for weld plates: Adjustable and Fixed

#### Design Data

Corrosion allowance:	0 mm (0 inch)
Material:	1.4404 EN 10028-7 and EN 13445
Design temperature:	150° C (302° F)
Minimum design metal temperature:	0° C (0° F)
Maximum allowable working pressure for weld plates <sup>1</sup> :	FV+ 0.7MPa (7 bar/101.5 PSI)
Design pressure, internal:	0.7MPa (7 bar/101.5 PSI)
Design pressure, external:	0.1MPa (1 bar/14.5 PSI)

The design is made according to EN 13445-3 and fulfils the requirements of PED 2014/68/EU.

Weld plates do not have a component certificate, but material certificate and pressure calculations can be supplied.

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<sup>1</sup> Mount blind cap in the weld plates (not Alfa Laval PlusClean®) when pressure testing the tank.

## 8.2 Specification of Pressure Weld Plates According to ASME VIII div. 1 and div. 2

Specification for weld plates: Adjustable and Fixed

### Design Data

Service:	Non-toxic
Corrosion allowance:	0 mm (0 inch)
Material:	Type 316L
Design temperature:	150° C (302° F)
Minimum design metal temperature:	0° C (0° F)
Maximum allowable working pressure for weld plates: <sup>2</sup>	FV+ 0.7MPa (7 bar/101.5 PSI)
Design pressure, internal:	0.7MPa (7 bar/101.5 PSI)
Design pressure, external:	0.1MPa (1 bar/14.5 PSI)

The design is made according to ASME VIII div. 1 and div. 2 and fulfils the requirements of the ASME standards.

Weld plates do not come with a U2 certificate, but material certificate and pressure calculations can be supplied.

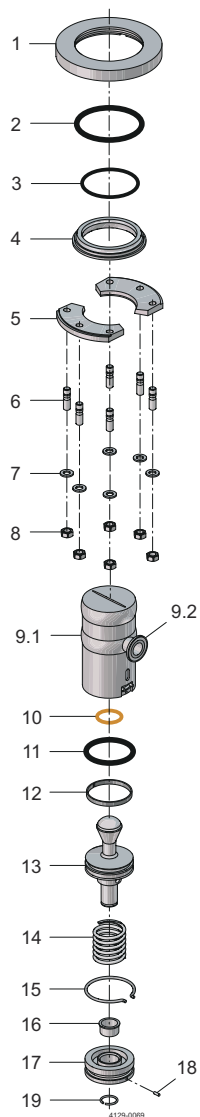
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<sup>2</sup> Mount blind cap in the weld plates (not Alfa Laval PlusClean<sup>®</sup>) when pressure testing the tank.



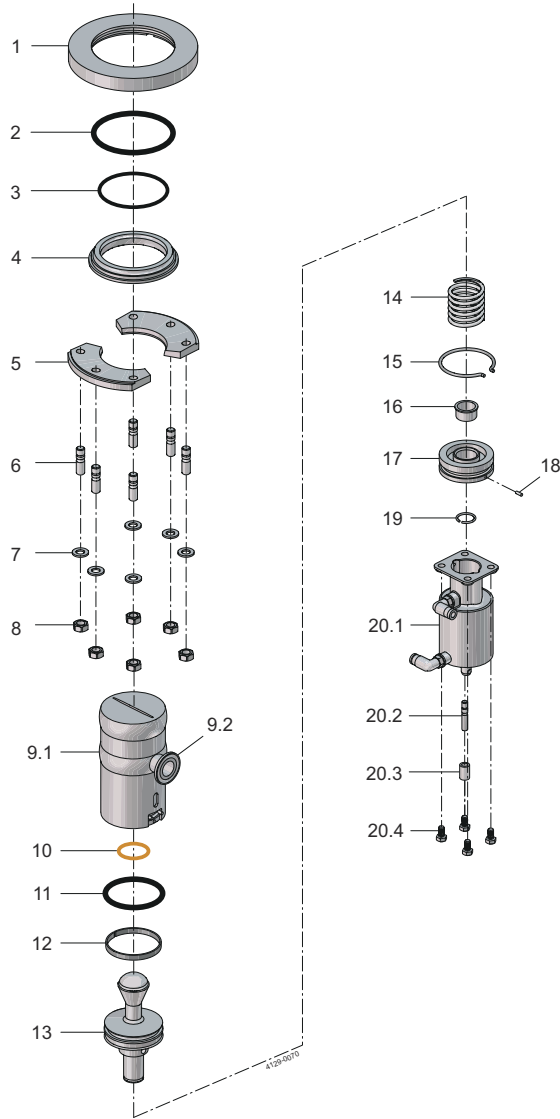
## 9 Parts Lists and Exploded Views

### 9.1 Media Driven



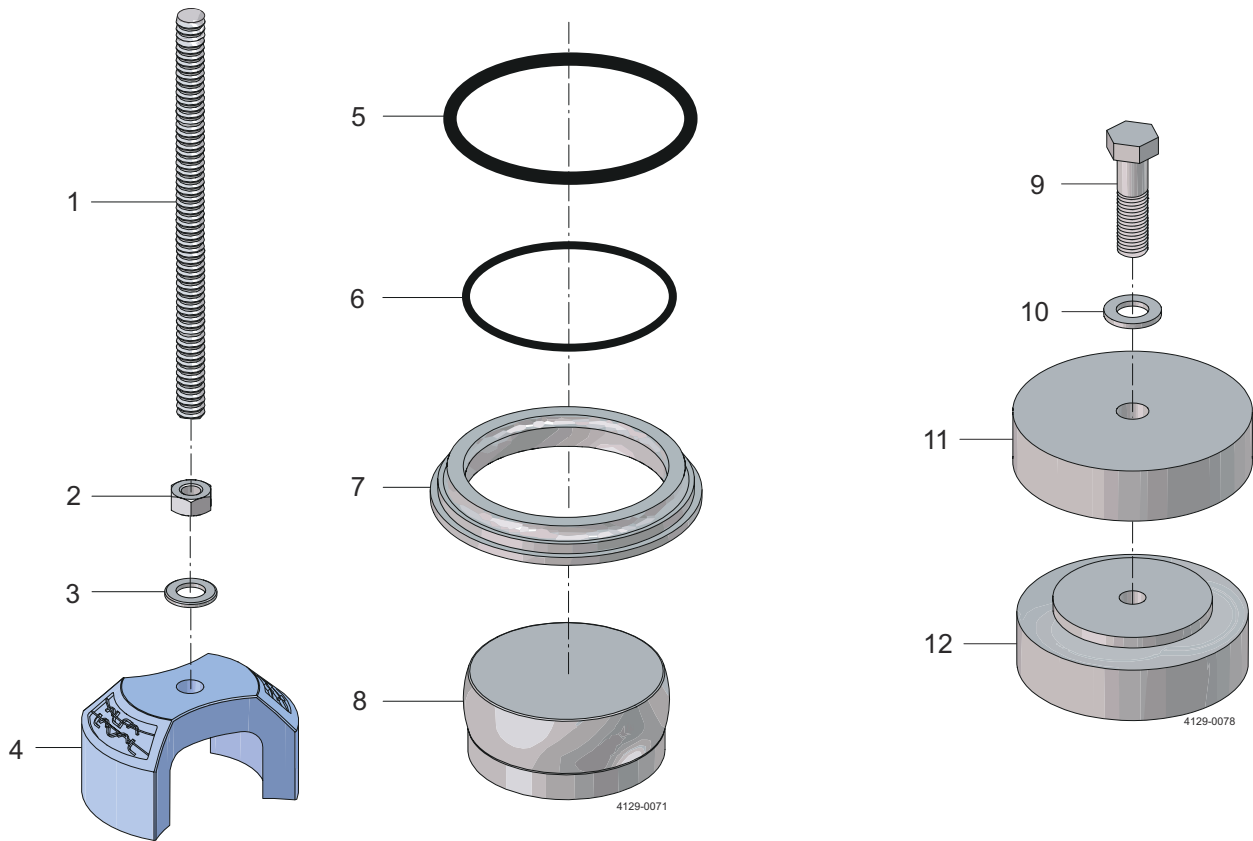
Pos.	Qty.	Denomination	Pos.	Qty.	Denomination
1	1	Weld plate	10	1	O-ring
2	1	O-ring	11	1	O-ring
3	1	O-ring	12	1	Guide ring
4	1	Adapter	13	1	Piston
5	2	Locking ring	14	1	Spring
6	6	Stud	15	1	Retaining ring
7	6	Washer	16	1	Bushing
8	6	Nut	17	1	End plate
9.1	1	Body	18	1	Positioning pin
9.2	1	Inlet	19	1	Retaining ring

## 9.2 Pneumatic Driven



Pos.	Qty.	Denomination	Pos.	Qty.	Denomination
1	1	Weld plate	12	1	Guide ring
2	1	O-ring	13	1	Piston
3	1	O-ring	14	1	Spring
4	1	Adapter	15	1	Retaining ring
5	2	Locking ring	16	1	Bushing
6	6	Stud	17	1	End plate
7	6	Washer	18	1	Positioning pin
8	6	Nut	19	1	Retaining ring
9.1	1	Body	20.1	1	PlusClean Actuator
9.2	1	Inlet	20.2	1	Connecting stud
10	1	O-ring	20.3	1	Actuator spacer
11	1	O-ring	20.4	4	Screw

### 9.3 Accessories and Tools



Pos.	Qty.	Denomination	Pos.	Qty.	Denomination
1	1	Screw	7	1	Adapter
2	1	Nut	8	1	Blind cap
3	1	Washer	9	1	Screw
4	1	Spring mounting tool	10	1	Washer
5	1	O-ring	11	1	Heatsink, Outside
6	1	O-ring	12	1	Heatsink, Inside

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## 10 Spare Parts

For every delivered Alfa Laval Product, a spare part list is available.

This spare part list contains a range of the most common wear parts for the machinery. If any component not mentioned is required, please contact your local Alfa Laval representative for availability.

You can find our spare part catalogue at <https://hygienicfluidhandling-catalogue.alfalaval.com/>

**Always** use Alfa Laval genuine spare parts. The warranty of Alfa Laval products is dependent on use of Alfa Laval genuine spare parts.

### 10.1 Ordering Spare Parts

When ordering spare parts, please always state:

1. Serial number (if available)
2. Item number/spare part number (if available)
3. Capacity or other relevant identification

### 10.2 Alfa Laval Service

Alfa Laval is represented in all larger countries of the world.

Do not hesitate to contact your local Alfa Laval representative, with any questions or requirement of spare parts for Alfa Laval equipment.

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# 11 Appendix

## 11.1 Appendix A - Weld Plate Installation

### WARNING

Pay special attention to the instructions below so that severe personal injury and/or damage to the weld plate and device is avoided.

Always read this manual thoroughly.

Install the device only when the tank is depressurized and cooled down.

This device may only be installed by qualified technical personnel who has read and understood the instruction manual!

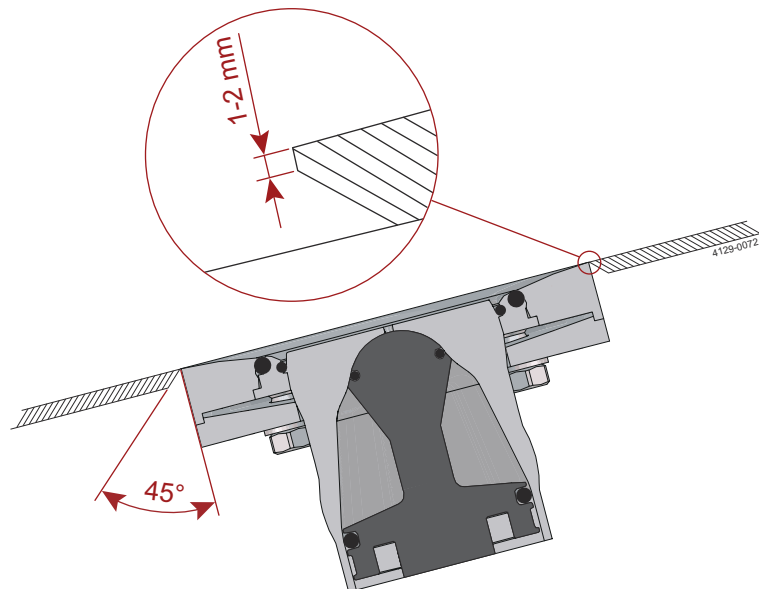
### Welding recommendations

### NOTE

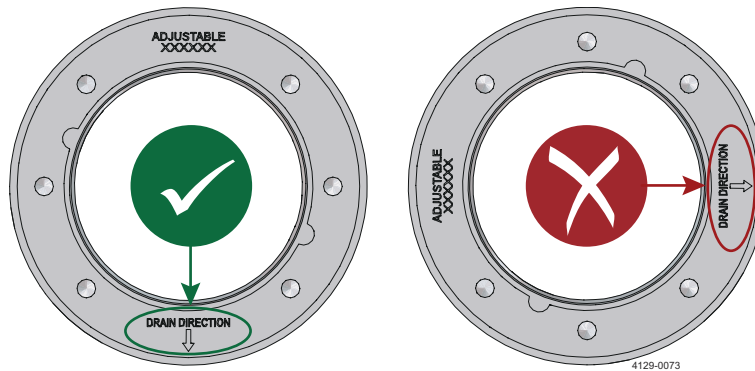
To ensure a hygienic weld (avoid or remove discoloration) it is recommended to use either shielding gas or pre-treatment of the welding zone. Weld plate thickness at welding zone is 15 mm (0.6") for the fixed weld plate and 18 mm (0.7") for the adjustable weld plate.

Incorrect welding procedures may deform and warp the weld plate - therefore it is recommended to use the HeatSink Kit without O-rings during welding to dissipate heat from the welding area. (See [Accessories and Tools](#) on page 51).

1. Cut a hole in the tank sized to the diameter of the weld plate (the gap between the hole and weld plate must be as small as possible)
2. Chamfer the outer edges by 45 degrees, leaving a 1-2 mm (0.039"-0.078") opening with the original diameter toward the inside of the vessel



3. Align the inside of the weld plate with the inside of the tank surface. When installed the machine has its CIP inlet in not applicable. When mounting the weld plate always have the thread holes in the position such that the machine is drainable when installed. Refer to [Mounting](#) on page 20 for machine drain ability information.



**Figure 2: Draining direction**

4. Using appropriate filler, tack weld the weld plate to the tank in positions 1 and 2 from inside of the tank as shown (Image 1). Ensure the weld plate is level; adjust if needed, and then tack weld it at positions 3 and 4. Ensure the weld zone is cooled down with compressed air between each point
5. Continue tack welding the weld plate at positions 5 through 8 from inside of the tank as shown (Image 2)
6. Allow the weld plate and welded areas to cool, using compressed air to speed the process as needed. Do not quench with water, as this may cause warping due to material shrinkage
7. Weld between positions 3 and 4 from the outside, and then cool the welded section using compressed air. Continue welding between the tack weld points 3 and 4 in opposite direction. Ensure that the welded sections are cooled down with compressed air after each welding
8. Allow the region to cool, then repeat step 7 from inside of the tank
9. Once the welding is complete, allow the weld plate to cool completely to room temperature. Do not quench the area with water, in order to avoid material warping
10. Finish the inside of the tank (and the outside, if desired) by grinding and polishing until flush with the wall. Be sure to allow the area to cool between grinding and polishing

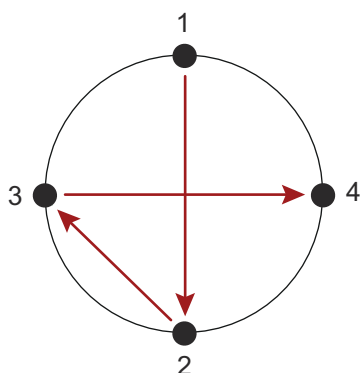


Image 1

From Inside of the tank

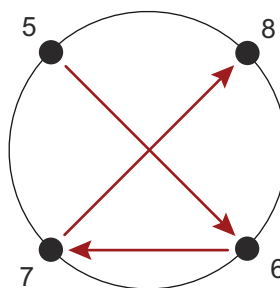


Image 2

From Inside of the tank

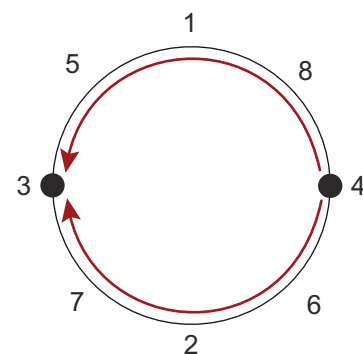


Image 3

First from outside of the tank